

Comment of Marjorie Lundquist, Ph.D., Bioelectromagnetic Hygienist,
on Federal Communications Commission (FCC) Proceeding 08-165:

FCC Commissioner Jonathan Adelstein has publicly asserted that the FCC has a role in limiting the actions of local governments with respect to petitions to local governments from wireless telephone companies to site a fixed transmitter, or to modify an existing configuration of such transmitters by adding more. I have read the Telecommunications Act of 1996 [hereafter "the Act"], which is the controlling legal authority for the erection of such transmitters, and I know that it mandates that the FCC establish health-protective regulations for transmitters (to comply with NEPA), while reserving to local governments all decisions regarding the siting of such fixed transmitters. The Act includes NO PROVISIONS that would (1) allow local governments to alter, modify, or over-ride the FCC's regulations on transmitter emissions that were established for health-protection reasons, or (2) allow the FCC to alter, modify or over-ride local government decisions about the siting of these transmitters.

The intent of Congress in the Act is clear: it is the EXCLUSIVE responsibility of the FCC to establish health-protective regulations for wireless telephone fixed transmitters, and it is the EXCLUSIVE responsibility of the appropriate local government to control the siting of these transmitters (within the limits established by the Act). If Congress had wanted the FCC to have limited authority over the siting of these transmitters, or if Congress had wanted local governments to have limited authority over the regulation of health effects from these transmitters, the language of the Act would have reflected this by explicitly providing for such limited authority. There is NO SUCH LANGUAGE present in the Act. Therefore the authority of the FCC to impose time limits on the siting decisions made by local governments simply DOES NOT EXIST under the Act.

FCC Commissioner Jonathan Adelstein is either ignorant of the Act, or else is biased, when he states that he has no doubt that the FCC has the authority to limit the transmitter siting decisions of local governments.

FCC Commissioner Jonathan Adelstein is also ignorant of either the facts, the science, or both when he falsely asserts that fears of people over the health effects of these transmitters, which is a major reason for the slow action of local governments, are "not based on facts" and are "not based on science" and are therefore "misperceptions".

The first controlled laboratory study designed to investigate the health effects of a lifetime of exposure to low-intensity microwave radiation was sponsored by the U.S. Air Force and was carried out in the early 1980s at the University of Washington under the direction of A. W. Guy. Specific-pathogen-free male Sprague-Dawley rats, 100 in the exposed group and 100 in the control group, were exposed or sham-exposed, respectively, almost continuously inside a waveguide to circularly polarized pulsed microwave radiation having a frequency of 2450 MHz.

Although this experiment had been completed by 1985, publication of the scientific report of the results of this experiment did not occur until 1992; the citation to this scientific report is:

C. K. Chou, A. W. Guy, L. L. Kunz, R. B. Johnson, J. J. Crowley & J. H. Krupp.

Long-term, low-level microwave irradiation of rats.
Bioelectromagnetics 13(6):469-496 (1992).

One reason for the long delay in publication of this report is that, in this experiment, the incidence of primary malignancies in the exposed group of rats was significantly higher than in the control group, which can only be interpreted as indicating that the microwave radiation to which these rats were exposed was carcinogenic, a conclusion that the Air Force did not want to accept.

There was also an increase in endocrine system tumors in the exposed group, compared to the control group--especially of one particular benign tumor of the adrenal medulla. These data demonstrated a statistically significant difference when evaluated by Fisher's exact test carried out as Fisher himself taught it--as a one-sided test--but in the scientific paper cited above, the application of Fisher's

exact test to this tumor data was reported to have given a result that was NOT statistically significant! I discovered this error when I read this paper almost a decade ago, and immediately called it to the attention of the senior author by letter. Dr. Chou replied that Fisher's exact test had been applied to the data as a two-sided test, and said this was correct. I knew this was not the proper way to test these data, so I telephoned J. J. Crowley, the author responsible for the statistical evaluation of the experimental data, to find out what he had to say. He simply told me that it was standard to carry out a two-sided statistical test of data, so it was correct to do so in this instance. I knew better, but I didn't argue with him.

Most statisticians would agree that Eric Leo Lehmann, Professor of Statistics at the University of California-Berkeley until he retired, has long been THE authority on statistical hypothesis testing. He authored a book titled TESTING STATISTICAL HYPOTHESES (I have read the 2nd edition, published in 1986 by Wiley, New York). In this book Lehmann discusses not only Fisher's exact test and its properties, but also the issue of whether a statistical test should be carried out as a one-sided test or a two-sided test. To summarize briefly, what Lehmann teaches is that one applies a one-sided statistical test whenever one is interested in the departure from the null hypothesis in ONLY ONE DIRECTION; if a departure from the null in EITHER direction is of interest, then a two-sided statistical test is appropriate. In the Air Force-sponsored rat experiment, the question of interest was whether microwave radiation posed a cancer risk to the rats. There was no interest at all in a deviation in the opposite direction, whereby microwave radiation might provide some protection AGAINST cancer, because the available data didn't suggest this.

Fisher devised his exact test in the first half of the 20th century as a way to test the statistical significance of data in which there is an obvious directional difference to the data; Fisher's exact test then simply evaluates the magnitude of the observed difference, in order to determine whether it is statistically significant, or not. Thus, according to Lehmann, Fisher's teaching of his exact test as a one-sided test of the data was correct. Only one directional departure of the data from the null hypothesis is of interest--the direction exhibited by the data--so whatever statistical test is

applied to such data should be a one-sided test.

Two sets of tumor data in the rat experiment showed an excess of tumors in the microwave-exposed rats, compared to the control group of rats. Fisher's exact test is correctly applied as a one-sided test and the results of using it to evaluate both sets of tumor data show that the difference is indeed statistically significant for both sets of data. The results of this experiment, when the data are CORRECTLY evaluated, therefore show that the microwave radiation to which these rats were exposed WAS INDEED CARCINOGENIC by any sensible criterion.

It is interesting that in the cited scientific paper by Chou et al., no mention is made in the text of the paper that the evaluation of the tumors by Fisher's exact test was carried out by applying the two-sided version of this test. Since Fisher's exact test is usually carried out as a one-sided test, most readers would assume that the data being reported on were evaluated by the one-sided version of Fisher's exact test. The reason that I caught this error when others did not is that I am very familiar with Fisher's exact test, and I thought those data LOOKED statistically significant, so I decided to check that out for myself--and found that they WERE!

The authors of that paper asserted (with no scientific justification) that one ought not to conclude that microwave radiation is carcinogenic unless there are TWO findings of statistical significance from the data in the experiment. Actually, there WERE two such findings of statistical significance in that experiment, but one of them had been artfully concealed by applying a two-sided test where a one-sided test was actually appropriate. Now that I have disclosed and corrected this error, it is clear that this experiment proves that chronic exposure to the microwave radiation in this experiment WAS INDEED CARCINOGENIC!

What property of the microwave radiation in this experiment was responsible for its carcinogenicity? There may have been several, but one was certainly the fact that this radiation was CIRCULARLY POLARIZED.

Physicists have known since 1910 that electromagnetic waves possess

energy, linear momentum, and angular momentum. In their interaction with matter, electromagnetic waves can impart to that matter energy, linear momentum and angular momentum.

They impart energy to matter as heat, producing a thermal effect. They impart linear momentum to matter as a pressure (a force per unit area), and they impart angular momentum to matter as a torque (a force acting through an angle). These two momentum-transfer effects are both nonthermal effects.

Of the two nonthermal momentum-transfer effects, the more damaging seems likely to be the transfer of angular momentum to matter, as this produces a twisting force, whereas linear momentum produces a simple pressure.

The polarization of a plane electromagnetic wave determines its angular momentum. A plane electromagnetic wave has an angular momentum of zero, whereas a circularly polarized electromagnetic wave has the maximum possible angular momentum (in one direction or the other). The angular momentum of an elliptically polarized plane wave would lie between these two extreme values. Therefore one would expect that a circularly polarized electromagnetic wave could pose a hazard from angular momentum transfer when it interacted with matter, whereas a plane-polarized electromagnetic wave (having zero angular momentum) would pose no such hazard.

The thermal effects of electromagnetic radiation are damaging to cells, including cancer cells, so cancer cannot possibly be a result of exposure to thermally hazardous radiation. I assert that the rats in the experiments I have discussed were harmed, at least in part, because the radiation they were exposed to was circularly polarized.

The FCC has established its emission standards for radio-frequency and microwave transmitters on the assumption that the only harmful effect of exposure to microwave radiation is a heating effect (because this is the basis of ANSI C95 and other current voluntary consensus standards for exposure to radio-frequency radiation). I have here shown that there can also be a cancer hazard associated with microwave radiation; for plane waves, this is determined by the

type of polarization of the radiation. [The situation is much more complicated for non-plane waves, and more complicated still if there are multiple sources of comparable strength present, as when multiple transmitters are mounted on a single tower.]

In short, the emission standards established by the FCC are NOT adequately protective of human health because they protect ONLY against the THERMAL effects of exposure to electromagnetic radiation, and fail utterly to protect against the nonthermal hazards, one of which is CANCER!

I remind the FCC of the fact that Representative Dennis Kucinich, in his capacity as the Chairman of the Subcommittee on Domestic Policy of the House Committee on Oversight and Government Reform, held a hearing on the health hazards of cellular telephones on September 25, 2008, in the Rayburn House Office Building in Washington, DC, at which two medical doctors--Ronald D. Herberman and David O. Carpenter --testified. Their testimony provides independent support of my assertion of a microwave radiation cancer hazard, though this particular cancer hazard has nothing to do with radiation polarization, and will be present in the "near field" of many transmitters that emit plane-polarized radiation. [The pertinent abstract listed below for the "near field" hazard is (4).]

I suggest that the FCC would better spend its time and resources revising its emission standards for radio-frequency and microwave transmitters so that these do a better job of protecting human health instead of trying to insert itself into matters that are legally the responsibility of OTHER agencies of government!

FCC Commissioner Jonathan Adelstein has said that there is "no evidence of a risk to human health" under FCC radio-frequency limits but I have been consulted by a number of individuals who have told me about horrendous health effects from an FCC-licensed transmitter situated near their residences. When they complain to the FCC, because it is the agency that licensed the transmitter, the FCC is interested in only one thing: Is the transmitter in compliance with FCC regulations? If the FCC investigates such a complaint at all, it focuses only on the question of whether its regulation is being

complied with. If the FCC determines that its regulation IS being complied with, then it concludes the investigation, finds that there was no merit to the complaint, and discards the complaint.

The FCC discards the complaint without ever investigating the report of illness, because the FCC is NOT a health and safety agency. Thus, when an FCC Commissioner says that there is no evidence of a risk to human health, it is not because the FCC has never received any such evidence; it is because the FCC DISCARDS all such evidence that it receives without ever investigating the complaint of ill health!

About a decade ago I wrote to the heads of the Environmental Protection Agency (EPA) and the FCC, asking that they establish an Interagency Agreement whereby any complaints of ill health that are received by the FCC would, after the FCC had completed its investigation, be forwarded to the EPA in order to provide this agency--which IS a health and safety agency--feedback regarding how well the FCC standards are protecting human health. My request was not replied to by either agency, nor was it acted upon.

People have been complaining to the FCC about ill health from FCC-licensed transmitters for decades, and for decades the FCC has been discarding their complaints after a review that disregards the health complaint! No wonder the FCC has "no evidence of a risk to human health"! Virtually all such evidence that it has received it has soon THROWN AWAY!

To summarize, the FCC should leave local governments alone and get busy putting its own house in order by promptly doing the following:

(1) Hold onto all complaints of ill health that are currently in FCC files instead of discarding them; enter into an Interagency Agreement with the EPA whereby either when the FCC first receives a complaint of ill health, or after its has completed its own investigation of such a complaint, it either provides the EPA a copy of the complaint, or else passes along the original complaint instead of discarding it; and when this Interagency Agreement takes effect, at once give the EPA all the complaints in the possession of the FCC that this agency would otherwise have discarded.

(2) Formally request the EPA to provide it a recommendation as to how to control the angular momentum hazard of the electromagnetic field around its transmitters. [This will give the EPA the needed justification to request money from Congress to study this issue.]

(3) Leave the local governments alone to deal with the wireless phone transmitter applications they receive as they best see fit!
If the FCC had better carried out the health protection mandate that Congress assigned to it, there would now be NO PROBLEM at the local government level!

For those who would like some more citations to published sources, I am providing the following citations to my abstracts published in the Bulletin of the American Physical Society:

(1) The non-ionizing electromagnetic field: Derivation of valid biological exposure metrics from Maxwell's equations of electromagnetism. Vol. 48, No. 1, pages 1296-1297 (March 2003).

(2) Chronic exposure to pulsed low-intensity microwaves is carcinogenic and tumorigenic. Vol. 49, No. 1, page 1296 (March 2004).

[Erratum: in Ref. [4] the correct year is "1997", not "1990".]

(3) A half-century ago physicists missed a major public service opportunity, costing the human race widespread chronic illness and many deaths! Vol. 50, No. 1, page 620 (March 2005).

(4) Today's "safe" radiofrequency (RF) exposure limits DON'T protect human health near transmitters! Vol. 50, No. 1, page 1178 (March 2005)

(5) A surprising answer to the search for a comprehensive health protection exposure metric for radiofrequency (RF) fields. Vol. 51, No. 1, page 518 (March 2006).

All of these abstracts contain citations to the published literature that may be of interest.

Submitted September 29, 2008, by Marjorie Lundquist, Ph.D. [physics]